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(54) PRODUCTION OF ANISOTROPIC CONDUCTIVE ADHESIVE FOR FLIP- CHIP BONDING OF PLASTIC SUBSTRATE

(57)Abstract:

PROBLEM TO BE SOLVED: To produce an anisotropic conductive adhesive at a high producivity and at a low cost by mixing an epoxy resin as the main ingredient with a conductive substance and a nonconductive substances at normal temperature for a specified time and mixing the resultant mixture with a coupling agent and a curing agent at normal temperature.

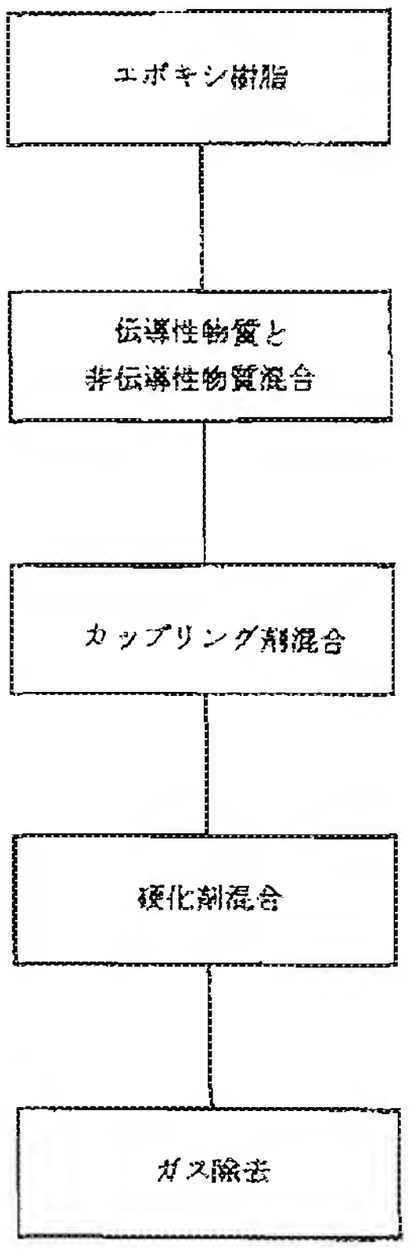
SOLUTION: A bisphenol F epoxy resin as the main ingredient is mixed with 6-20 wt.% conductive substance powder having a particle size of 5-10 μm and 30-50 wt.% nonconductive substance powder having a particle size of 0.1-1 μm at normal temperature for 3 hr. The resultant mixture is mixed with 3-5 wt.% coupling agent (e.g. 3-glycidoxypropyltrimethoxysilane) and 30-50 wt.% (based on the epoxy resin) imidazole-base curing agent at normal temperature for 1 hr, thus giving the objective anisotropic conductive adhesive. Examples of the conductive substance are solder, gold-coated polystyrene, a silver powder and a nickel powder. Examples of the nonconductive substance are an alumina powder, a beryllia powder, a silicon carbide powder and a silica powder.

CLAIMS

[Claim(s)]
[Claim 1] The manufacture approach of the high-reliability anisotropy conductivity adhesives for flip chip bonding of the plastic plate characterized by mixing the conductive matter and the non-conductivity matter in ordinary temperature for 3 hours, adding a coupling agent and a curing agent to this, mixing in ordinary temperature for 1 hour, and manufacturing by using an epoxy resin as an adhesives principal component in anisotropy conductivity adhesives.
[Claim 2] A coupling agent 3-glycidyloxypropyl trimethoxysilane (3-glycidyloxy propyl trimethoxy silane), 2- (3 and 4-epoxycyclohexyl)-ethyltrimethoxysilane (2-(3, 4-epoxycyclohexyl)-ethyl trimethoxysilane) or 3-glycidyloxy propylmethyl diethoxysilane (3-glycidyloxy propyl methyl diethoxy silane) -- 3 - 5wt% -- the manufacture approach of the high-reliability anisotropy conductivity adhesives for flip chip bonding of the plastic plate according to claim 1 characterized by using it.
[Claim 3] a curing agent -- imidazole system HX3941 HP or HX3748 HP -- per [epoxy weight] 30 - 50wt% -- the manufacture approach of the high-reliability anisotropy conductivity adhesives for flip chip bonding of the plastic plate according to claim 1 or 2 characterized by using it.
[Claim 4] the polystyrene (Polystyrene) macromolecule, silver (Ag) powder, or nickel (nickel) powder with which, as for the conductive matter, coating of a solder (Solder) and the gold (Au) was carried out -- the diameter of 5-10 micrometers -- carrying out -- 10 - 20wt% -- the manufacture approach of the high-reliability anisotropy conductivity adhesives for flip chip bonding of the plastic plate according to claim 1, 2, or 3 characterized by using it.
[Claim 5] the non-conductivity matter -- alumina (aluminum 2O3) powder, beryllia (BeO) powder, silicon carbide (SiC) powder, or silica (SiO2) powder -- the diameter of 0.5-1 micrometer -- carrying out -- 40 - 50wt% -- the manufacture approach of the high-reliability anisotropy conductivity adhesives for flip chip bonding of the plastic plate according to claim 1, 2, 3, or 4 characterized by using it.

[Translation done.]

Drawing selection Representative drawing



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* NOTICES *

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2.**** shows the word which can not be translated.
3.In the drawings, any words are not translated.

DETAILED DESCRIPTION

[Detailed Description of the Invention]
[0001]
[The technical field to which invention belongs] This invention relates to the manufacture approach of the high-reliability anisotropy conductivity adhesives for flip chip bonding of a plastic plate (Anisotropic Conductive Adhesive and Following ACA are called) of mixing the conductive matter, the non-conductivity matter, a coupling agent, and a curing agent by using an epoxy resin as a principal component, and having a fixed coefficient of thermal expansion.
[0002]
[Description of the Prior Art] In the case of 1 million or more cel (cell) accumulation and a non-memory device, the semiconductor technology into which it has developed quickly recently has developed into inclinations, such as the frequent I/O (Input/Output; I/O) pin number, large die magnitude, thermal emission, and a high electrical order. However, in spite of rapid development of semiconductor technology, the actual condition is that an electronic-packaging technique cannot support this. An electronic-packaging technique is one field in the important technique of determining the engine performance of the last electronic product, magnitude, a price, dependability, etc. A high electric minima type / high density, low power, various functions, ultra high-speed signal processing, and eternal dependability are pursued especially. In the latest electronic product minima type package components A computer, an information communication link, A flip chip (Flip Chip) technique as indispensable components, such as mobile communication and high-class home electronics, a smart card (smart cards), It is broadly utilized for display (Display) packaging, such as a liquid crystal display (LCD) and a plasma-display panel (PDP), a computer, portable telephone, communication system (Communication system), etc.
[0003] It is substituting for such flip chip assembly technique from the connection process using the existing solder (Solder) to the connection using the conductive adhesives which have the advantages, such as cheapness, pole detailed electrode pitch possibility of, an environmental affinity-process of a non-solvent (fluxless) process, and a low-temperature process.
[0004] The class of conductive adhesives has products, such as an anisotropy conductivity film / adhesives (Anisotropic Conductive Film/Adhesive), and isotropic conductivity adhesives (Isotropic Conductive Adhesive), and consists of conductive particles, such as nickel (nickel), gold/polymer (Au/polymer), and silver (Ag), and thermosetting and thermoplastic insulating resin (insulating resin) fundamentally. In order to secure interconnect (interconnection) using the conductive adhesives which it is more reliable and have low resistance and high adhesive strength, the magnitude of an electric conduction particle, the optimum value of distribution, a content, and the amount of modification, etc. must be known, and anisotropy conductivity adhesives need to be developed of lower temperature among quick time amount because of the cheap flip chip process development using development of the adhesives resin which can

be hardened, an adhesives production process, and such adhesives.
[0005] Although anisotropy conductivity adhesives have a film gestalt and a paste (paste) gestalt, in this invention, the chief aim point is put on adhesives development of a paste gestalt for the simple nature of the production process of the adhesives for the flip-chip-bonding process of a plastic plate and a chip.
[0006] Since the flip chip assembly technique which used conductive adhesives clearly to current is not standardized, the Japanese firm of Hitachi of the head runner of conductive adhesives development and Sony Corp., the university in Europe which is continuing inquiring systematically through a many state research consortium, and the associated company lab of each country are developing a competition violent for the world commercial-scene preoccupation which passes a standardization of an in-house product. Especially, an electronic packaging technique is one of the most important parts in manufacture of an electronic product, use of the connection ingredient which secured the electric electric conduction which substitutes for solder connection of a technique selection and the process of the material of construction, and the situation that ingredient development is important-ize, according to the inclination of an environmental affinity-product, and dependability is needed, and use of newer conductive adhesives is capture the spotlight.
[0007] Although there are (1) No-flow underfill technology, (2) Conventional ACA, etc. as a conventional technique concerning this invention, it is the side face in which are the technique in which a lower filler is formed, and do not contain a conductive particle, but (2) has only an electric conduction particle in ACA, and a coefficient of thermal expansion does not usually have high-reliability greatly when (1) connects the chip with which the solder is already formed to a substrate, and it is a different technique from this invention.
[0008]
[Problem(s) to be Solved by the Invention] This invention tends to offer the new anisotropy conductivity adhesives which have in coincidence the improvement function in mechanical dependability of the lower packing material of electric conductivity and a solder flip chip which manufactures the high-reliability anisotropy conductivity adhesives for flip chip bonding of the plastic plate which mixes the conductive matter which uses an epoxy resin as a principal component, the non-conductivity matter, a coupling agent, and a curing agent, and has a fixed coefficient of thermal expansion, and the anisotropy conductivity film has conventionally. Namely, it aims at ACA offer which is made to connect a flip chip and can embody an easy connection process, high productivity, and a cheap price according to the heat overpressure force, after applying ACA of this invention and aligning a chip on the printed circuit board (PCB) which consists of plastics.
[0009]
[Means for Solving the Problem] The anisotropy conductivity adhesives of this invention add a coupling agent and a curing agent, and they are mixed in ordinary temperature for 1 hour (mixing), they manufacture [the conductive matter 1 and the non-conductivity matter 2 are mixed in ordinary temperature by using a liquefied epoxy resin as an adhesives principal component for 3 hours] them, and the production process is as drawing 1. An epoxy resin does not use a solvent, in order not to use various epoxy resins unlike the adhesives/film using the existing epoxy resin but to adjust viscosity (viscosity) by using bisphenol EFUTAIPU (Bisphenol F type). The polystyrene (Polystyrene) macromolecule with which, as for the conductive matter 1, coating of a solder (solder) and the gold (Au) was carried out, Make silver (Ag) powder or nickel (nickel) powder into the diameter of 5-10 micrometers, and 6 - 20wt% is used. The non-conductivity matter 2 used in order to adjust the mechanical physical properties of an epoxy resin makes alumina (aluminum 2O3) powder, beryllia (BeO) powder, silicon carbide (SiC) powder, or silica (SiO2) powder the diameter of 0.1-1 micrometer, and uses 30 - 50wt%. Under the present circumstances, although the magnitude of the conductive matter 1

must be larger than the magnitude of the non-conductivity matter 2, this is for the conductive particle in adhesives to contact BOMPU of a chip 4, and inter-electrode [of a substrate 3], and to give conductivity. On the other hand, the non-conductivity matter 2 affects physical properties like a coefficient of thermal expansion to the part to which BOMPU of the chip 4 of a glue line and the electrode of a substrate 3 contacted. By the epoxy system coupling agent (coupling agent) of the conductive matter 1 and the non-conductivity matter 2, and 3-glycidyloxypropyl trimethoxysilane (3-glycidyloxy propyl trimethoxy silane), 2- (3 and 4-epoxycyclohexyl)-ethyltrimethoxysilane (2-(3, 4-epoxycyclohexyl)-ethyl trimethoxy silane) or 3-glycidyloxy propylmethyl diethoxysilane 3 - 5wt% is added for (3-glycidyloxy propyl methyl diethoxy silane). the curing agent of HX3941 HP of marketing for thermal hardening of an epoxy resin, or a HX3748 HP (product made from Japan Asia Ciba) imidazole system -- per [epoxy weight] 30 - 50wt% -- in addition, it manufactures.

[0010] Hereafter, the following example, the example of a trial, and the example of application explain this invention. However, the technical range of this invention is not restricted at all by these.

[0011]

[Embodiment of the Invention] The manufacture approach of the anisotropy conductivity adhesives of example 1 this invention used the process shown in drawing 1. nickel powder with the alignment possibility good [the conductive matter 1] use the liquefied epoxy resin of a bisphenol female mold as a principal component, and according to a mechanical strength, electric conductivity, and a magnetic field -- the diameter of 5 micrometers -- carrying out -- 6wt (s)% -- using it -- the non-conductivity matter 2 -- the diameter silica (SiO2) powder of 1 micrometer -- 10wt(s)% -- it was used and mixed in ordinary temperature for 3 hours. then, a coupling agent -- 3-glycidyloxypropyl trimethoxysilane 3wt% -- adding -- a thermal hardening of an epoxy resin sake -- a kind of an imidazole (imidazole) system -- it is -- a commercial HX3941 HP (product made from Japan Asia Ciba) curing agent -- per epoxy resin weight -- 50wt(s)% -- it comes out comparatively and, in addition, manufactures through mechanical mixing for 1 hour in ordinary temperature. In order to remove this, it was made to inhale under vacuum, although many air bubbles are generated in a mixing process and in adhesives.

[0012] the example 2 conductivity matter 1 -- diameter nickel powder of 5 micrometers 10wt%, and the non-conductivity matter 2 -- the diameter silica (SiO2) powder of 1 micrometer -- 50wt (s)% -- if it removed mixing, anisotropy conductivity adhesives were manufactured by the same approach as the above-mentioned example 1.

[0013] the example 3 conductivity matter 1 -- diameter nickel powder of 5 micrometers 15wt%, and the non-conductivity matter 2 -- the diameter silica (SiO2) powder of 1 micrometer -- 45wt (s)% -- if it removed mixing, anisotropy conductivity adhesives were manufactured by the same approach as the above-mentioned example 1.

[0014] the example 4 conductivity matter 1 -- diameter nickel powder of 5 micrometers 20wt%, and the non-conductivity matter 2 -- the diameter silica (SiO2) powder of 1 micrometer -- 40wt (s)% -- if it removed mixing, anisotropy conductivity adhesives were manufactured by the same approach as the above-mentioned example 1.

[0015] In order to check change of the adhesives coefficient of thermal expansion after hardening by the amount of mixing of the example of trial non-conductivity matter 2, the content of nickel powder was fixed to 10wt(s)% by the conductive matter 1, and the silica (SiO2) powder content was changed to 0 - 60wt% by the non-conductivity matter 2, in addition the matter and the amount used manufacture and stiffened anisotropy conductivity adhesives by the same approach as the above-mentioned example 1. Then, carrying out a temperature up at the rate of 5 degrees C per part to 250 degrees C in ordinary temperature by TMA (Thermo Mechanical Analysis), by the approach of measuring die-length change of the piece of an initial trial, the coefficient of thermal expansion of adhesives was measured and the result